

Comparing Mid-Frequency Active Sonar to a Saturn V Rocket

For several reasons, it is inaccurate and misleading to claim that the sound of mid-frequency active sonar in water is equivalent to a Saturn V rocket.

Sound levels in water and sound levels in air are expressed very differently*, and therefore comparing sound levels in water and air must be done carefully.

As an example of the difference in the way sound levels are received in air versus water, note that a sound level of 120 dB sound pressure level in air (similar to a rock music amplifier 4-6 feet from the listener) can cause hearing damage or distress to humans and animals, while human divers and animals receiving 120 dB sound pressure level underwater experience no such issues.

1. Saturn V Rocket is 10x Louder: At 1000 yards (914 m) from a Navy ship, the receive level for mid-frequency active sonar is approximately 175 dB in water. At the same distance in water, a Saturn V rocket would register 197 dB. This 22 dB difference means that the Saturn V rocket would have approximately **ten times greater intensity** than mid-frequency active sonar at the same distance. Temporary threshold shift (TTS), which is the National Marine Fisheries Service's baseline for non-permanent effects on marine mammals, is 195 dB, so the Saturn V rocket would have the potential to cause TTS to marine mammals at 1000 yards, whereas mid-frequency active sonar at the same distance would not.

2. Saturn V Sound is Continuous, Mid-Frequency Active Sonar Sound is Intermittent: Rocket engine noise is a continuous sound source, lasting for many minutes at a time. By comparison, sonar pings are intermittent, with each ping lasting one second or less and being repeated about every 30 seconds. **Over the course of one minute, ship and animal movement at sea would make it very unlikely that a marine mammal would be exposed to even two sonar pings.** By comparison, marine mammals would be far more likely to be exposed to the continuous "roar" of rocket engine sound during a similar timeframe.

3. Saturn V Frequencies Would Potentially Affect More Species: Rocket engine sound is a broadband sound, spanning as many as five octave frequencies. Sonar signals are limited to a narrow band, typically 1/3 octave frequencies or less. **The greater number of frequencies from the broadband rocket sound would make it likely that more types of species would be affected by the rocket sound than by the narrow band sound of mid-frequency active sonar.**

*All sound levels in water are referenced to 1 microPascal (μPa). All sound levels in air are referenced to 20 microPascal (μPa), often expressed as sound pressure level (SPL). Sound waves with the same intensities in water and air have relative intensities that differ by 61.5 decibels (dB). Therefore, 61.5 dB must be added to relative intensities in air to obtain the relative intensities of sound waves in water.